भारतीय मानक
Indian Standard

IS 17075 : 2019

ईंधन में सम्मिश्रक घटक के रूप में उपयोग के लिए निर्जल मेथनॉल — विशिष्टि

Anhydrous Methanol for Use as a Blending Component in Fuels — Specification

ICS 75.160.20

© BIS 2019

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

January 2019 **Price Group 7**

Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee, PCD 03

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee was approved by the Petroleum, Coal and Related Products Division Council.

Existing Indian standard IS 517 : 1986 'Specification for methanol (methyl alcohol) (*second revision*)' includes the requirements and test methods of methanol to be used in various applications other than fuel purposes. Similarly, ASTM D 1152 : 2016Standard specification for methanol (methyl alcohol) and IMPCA specifications, 2015 (International Methanol Producers and Consumers Association) provides specification of methyl alcohol for wider application and not limited to automotive application. Methanol is considered as an alternative fuel source that offers environmental friendly characteristics associated with its use. Hence, the Committee decided to prepare a separate specification for anhydrous methanol to be used for blending with motor gasoline fuel in different proportions and the blended fuel is intended for use in engines designed for running on such fuel for captive power generation, industrial, marine, locomotive, automotive and off-road applications.

This specification for anhydrous methanol can be used for any of the above mentioned applications which could be blended in various ratios with motor gasoline fuel meeting IS 2796 or other fuels in future, as recommended by Ministry of Petroleum and Natural Gas (MoP&NG) or Ministry of Road Transport and Highways (MoRTH).

Specifications for methanol blended gasoline, M15 fuel (15 percent admixture of anhydrous methanol in motor gasoline), M85 fuel (85 percent admixture of anhydrous methanol in motor gasoline) and M96 fuel (containing 96 percent of anhydrous of methanol) are also under preparation and can be referred to.

The composition of the Panel for Methanol Fuels, PCD3:1/P-1 and Committee responsible for the formulation of this standard is given in Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ANHYDROUS METHANOL FOR USE AS A BLENDING COMPONENT IN FUELS — SPECIFICATION

1 SCOPE

This standard prescribe the requirements, methods of sampling and tests for anhydrous methanol used as a blending component in methanol based fuels, used in engines designed for running on such fuels for captive power generation, industrial, marine, locomotive, automotive and off-road applications.

2 REFERENCES

The following standard contains provisions, through which reference in this text constitute the provisions of the standards. At the time of publication, the editions indicated were valid. All the standards are subject to revision, and parties enter in to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below:

Indian Standard	*Title*
82 : 1973	Method of sampling and test for thinners and solvent for paints (*second revision*)
323 : 2009	Rectified spirit for industrial use — Specification (*second revision*)
2214 : 1977	Specification for silver nitrate, pure and analytical reagent (*first revision*)
2263 : 1979	Methods of preparation of indicator solutions
4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
1448 [P : 16] : 2014/ ISO 3675 : 1998	Methods of test for petroleum and its products [P : 16] Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (*fourth revision*)

3 TERMINOLOGY

For the purposes of this standard, the following definition shall apply.

3.1 Methanol — Methanol is essentially methyl alcohol, which is meant for use as blending component in fuel for engines.

4 REQUIREMENTS

4.1 Description

Anhydrous Methanol shall be clear, colorless homogeneous liquid, free from suspended matter.

4.2 The material shall also comply with the requirements given in Table 1, when tested in accordance to appropriate methods prescribed under ‘P’ series of IS 1448 or other suitable test methods, reference to which is given in col 4 of the Table 1.

4.3 Miscibility with Water

The material shall show no turbidity when 1 volume is mixed with 19 volumes of water at 27 ± 2°C and examined as prescribed in Annex A.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed and supplied in suitable containers in accordance with the shipping regulations laid down by Petroleum and Explosives Safety Organization (PESO) from time to time.

5.2 Marking

5.2.1 Each container shall be marked with the following information:

a) Name of the material;
b) Indications of the source of manufacturer, symbol or trade mark, if any;
c) Volume of the contents, in litre;
d) Year of manufacture or packing;
e) Flammable, cumulative poison, ingestion or absorption is dangerous and causes blindness; and
f) Any other statutory requirement.

5.2.2 *BIS Certification Marking*

The container shall be also marked with standard mark.

5.2.2.1 The use of standard mark is governed by the provisions of *Bureau of Indian Standards Act,* 2016 and the rules and regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

6 SAMPLING

Representative samples of the material shall be drawn as prescribed in Annex E.

7 QUALITY ASSURANCE

7.1 Methanol quality assurance is based on batch certification of the manufacturers at production plant. The product should meet the required specification and results are representative of the production and supply.

7.2 The minimum requirements of information to be shown on the methanol batch quality certificate at point of manufacture are us under:

a) Product name/number and any amendment number if any;
b) Name and address of the testing laboratory;
c) Batch number or unique identification number;
d) Properties tested including specification limit, test method and result of test;
e) Identification of the signatory certifying the report;
f) Date of certification; and
g) Quantity certified.

8 TEST METHODS

Tests shall be conducted according to the methods prescribed in the Table 1 and Annexes.

Table 1 Requirement for Anhydrous Methanol for Use as a Blending Component in Fuels

(*Clause* 4.2)

Sl No.	Characteristics	Requirements	Ref to Test Method as Part of IS/ASTM/IP
(1)	(2)	(3)	(4)
i)	Appearance	Clear and bright, free from un-dissolved water, foreign matter and other visual impurites	Visual
ii)	Color	L 10	ASTM D 1209 / ASTM D 5386[1]
iii)	Density, kg/m^3 at 20°C	791-793	ASTM D 4052[1] / D 1298 / IP 160/ IS 1448 [P : 16]
iv)	Methanol, purity percent, w/w, *Min*	99.6	Annex A / Annex B[1]
v)	Acetone, mg/kg, *Max*	30	Annex B
vi)	Impurities, minutes at 15°C ($KMnO_4$ test), *Min*	50	ASTM D 1363
vii)	Boiling point, °C	64.5 to 65.5	ASTM D 1078
viii)	Non volatile matter, mg/100 ml, *Max*	5	ASTM D1353[1]; IS 82
ix)	Moisture, percent, v/v, *Max*	0.10	ASTM E 1064
x)	Total acidity, as free acetic acid, wt. percent, *Max*	0.003	ASTM D1613[1] / Annex C
xi)	Total sulphur, mg/kg, *Max*	1.0	ASTM D5453[2]
xii)	Chorlide, mg/kg, *Max*	0.5	Annex D

NOTES:

1 In case of dispute, this shall be the referee method.

2 The scope of ASTM D5453 is limited between 1 to 8000 mg/kg. However, this method is suggested in the absence of alternate and suitable test method to detect less than 1 mg/kg of Sulphur. It is recommended the test laboratory to have demonstrated and documental evidence of the equipment capability to detect less than 1 mg/kg.

ANNEX A

[*Table* 1, *Sl no* (iv)]

PURITY AND IMPURITIES OF METHANOL

A-1 SCOPE

This method describes a procedure for the determination of the purity and impurities (for example, acetone, ethanol, BTEX) of methanol.

WARNING — *See* material safety data sheet of methanol.

A-2 METHOD SUMMARY

Internal standard is added to the sample and subsequently the major impurities are identified and quantified by gas chromatography with flame ionization indicator (GC-FID). The impurities and purity on dry basis are calculated.

A-3 APPARATUS

A-3.1 Gas Chromatograph with FID Detector

A-3.2 GLC Column (DB 1 - 60 in × 0.32 mm ID and 5.0 µm film Thickness) or Equivalent.

A-3.3 Volumetric Flask, 100 ml.

A-3.4 Micropipette, 10µ1.

A-4 CHEMICALS (MINIMUM PURITY OF 99 PERCENT)

A-4.1 *sec*-Butanol (2-Butanol)

A-4.2 Ethanol

A-4.3 iso-Propanol (2-Propanol)

A-4.4 iso-Butanol (2-Methyl-1-propanol)

A-4.5 Acetone

A-4.6 Methylacetate

A-4.7 Methyl Tertiary Butyl Ether (MTBE)

A-4.8 Methyl Ethyl Ketone(MEK)

A-4.9 Benzene

A-4.10 Toluene

A-4.11 Ethylbenzene

A-4.12 Ortho-xylene

A-4.13 Meta-xylene

A-4.14 Para-xylene

A-5 PROCEDURE (TYPICAL GAS CHROMATOGRAPHIC CONDITIONS)

A-5.1 Prepare the gas chromatograph as described in the manual and use the coma settings:

a) Injection temperature: 275°C.
b) Detection temperature: 275°C.
c) Oven temperature: start 5 min at 50°C; rise 5°C/min to final temperature, 1 = 100°C (hold 0 min): rise 10°C/min to final temperature, 2 = 250°C (hold 4 min.).
d) Carrier gas: Helium, nitrogen or hydrogen.
e) Split: 50 ml/min.
f) Column pressure: approx. 100 kpa (helium), 80 kPA (nitrogen), 45 kPa (hydrogen)
g) Injection volume: 1 µl

A-5.2 When the method is fast set-up or has not used for a long period, determine the response factors for all impurities (**A-4**) for 2 concentration levels (for example, 5 mg/kg and 100 mg/kg), relative to *sec*-Butanol present at a concentration of 10 µl per 100 ml.

The difference between the response factors determined at both levels should not exceed 10 percent. The average response factors are used for the quantification of the individual impurities.

A-5.3 Transfer approximately 80 ml of sample to a 100 ml volumetric flask.

A-5.4 Add 10 µl of sec-butanol (**A-4.1**) as internal standard and fill up to the mark with sample and homogenize.

A-5.5 Run the mixture under the GLC zondition as described in **A-5**.

A-6 CALCULATION

A-6.1 Calculate the contents of the impurities in mg/kg by the internal standard method as follows:

Component X, mg/kg =

$$\frac{Area\ (component\ in\ mixture)}{Area\ (istd\ in\ mixture)} \times RF \times conc.\ (istd\ in\ mixture)$$

Where,

RF = response factor for the component relative to *sec*-butanol; and

conc. (*istd in mixture*) = concentration of *sec*-Butanol in mg/kg.

A-6.2 For unknown impurities (impurities not present in **4**) use RF 1.00 for calculations.

A-6.3 When already some *sec*-butanol is present in the original sample, a correction in the internal standard concentration has to be made.

A-6.4 Calculate the purity on dry basis in percentage, W/W as follows:

Purity on dry basis, percent W/W =

$$100\% - \frac{sum\ of\ all\ impurities\ in\ mg/kg}{10,000}$$

NOTE — Water content should not be subtracted.

A-7 REPORT

A-7.1 The content of impurities should be reported in mg/kg and rounded to the nearest whole mg/kg.

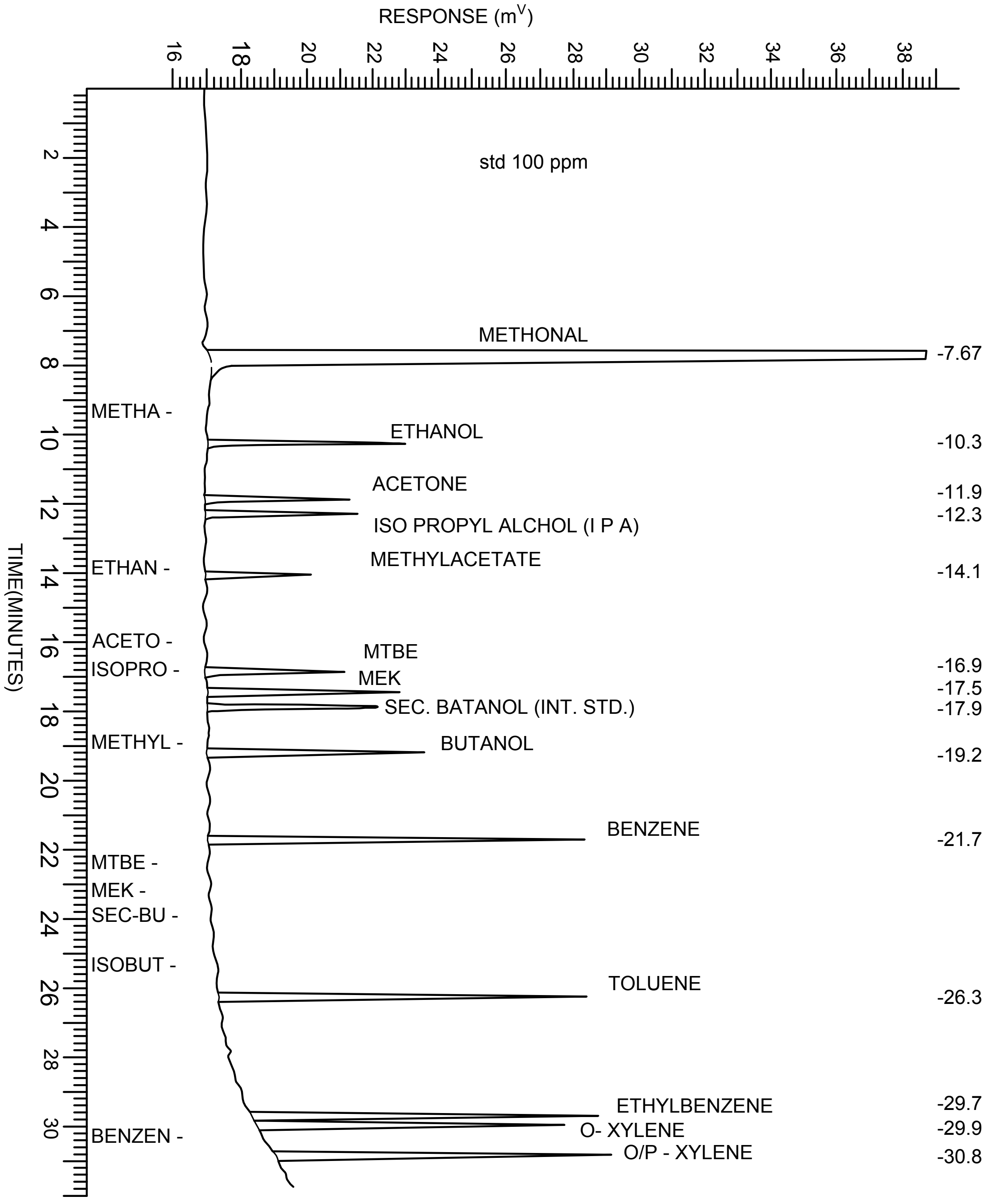
A-7.2 The lower limit of the determination of the ethanol content and other impurities is 5 mg/kg. The purity on thy basis should be reported in percent W/W and rounded to 0.01 percent W/W.

A-8 PRECISION

The precision of this determination is yet unknown.

TYPICAL SETTINGS

GC	: Split/Splitless Injector I FID-Detector
Column	: HP-1 60 × 0.32 D_f : 5.0 1.1m
Injectionvolume	: 1 µl (autosampler)
Run time	: 34 min
Internal Standard	: *sec*-Butanol 10 uL in 100 mL
Oven	
Initial Temp	: 50°C
Initial Hold	: 5 min
Rise1	: 5°C/min
Final. Temp1	: 100°C
Hold	: 0 min
Rise 2	: 10°C/min
Final. Temp 2	: 250°C
Final Hold	: 4 min
Injection	: 275°C
Detection	: 275°C
Carrier gas	: Helium (100 kPa), nitrogen (80 kPa) or hydrogen (45 kPa)
Split	: 50 ml/min



TYPICAL CHROMATOGRAM OF STANDARD (100 MG/KG IMPURITIES)

ANNEX B

[*Table* 1, *Sl No.* (iv) and (v)]

DETERMINATION OF ALDEHYDES AND KETONES — HYDROXYAMMONIUM CHLORIDE METHOD

B-1 OUTLINE OF THE METHOD

Reaction with hydroxylamine hydrochloride forms the basis for determination of carbonyl function (aldehydes and ketones). Condensation products called oxirnes are produced. The hydrochloric acid released in the reaction is titrated with standard sodium hydroxide solution using bromophenol blue as indicator.

B-2 REAGENTS

B-2.1 Standard Sodium Hydroxide Solution, 0.1 N.

B-2.2 Rectified Spirit, 95 percent by volume (*see* IS 323).

B-2.3 Bromophenol Blue Indicator

Dissolve 0.2 g of bromophenol blue in 3 ml of the standard sodium hydroxide solution and dilute to 100 ml with rectified spirit.

B-2.4 Hydroxylamine Hydrochloride Solution

Dissolve 4 g of hydroxylamine hydrochloride in 20 ml of water. Dilute this to 200 ml with rectified spirit, heat on a boiling water-bath for 30 min. Cool and add 5 ml of the bromophenol blue indicator with just sufficient sodium hydroxide solution (2 N) to impart a dichroic yellow-green colour to the liquid.

B-3 PROCEDURE

Measure 25 ml of the material into a 150 ml conical flask, add 25 ml of hydroxylarnine hydrochloride solution and, after loosely stoppering, heat on a boiling water-bath for 10 min. Cool and titrate with standard sodium hydroxide solution until as near a match as possible is obtained with a control made by mixing 25 ml or distilled water with 25 ml of hydroxylamine hydrochloride in a similar 150 m1 conical flask.

B-4 CALCULATION

Aldehydes and ketones (as acetone), percent by mass =

$$\frac{0.023(V-0.6)}{S}$$

Where,

V = volume in ml, of standard sodium hydroxide solution, and

S = specific gravity of the material taken at the temperature of the test.

NOTE — The correction 0.6 is subtracted from the number or millilitres of sodium hydroxide solution used to allow far the effect on the indicator of different alcohol concentration in the experiment and control.

ANNEX C

[*Table* 1, *Sl No.* (x)]

TOTAL ACIDITY

C-1 OUTLINE OF THE METHOD

Total acidity is calculated in terms of acetic acid, by titration method.

C-2 REAGENTS

C-2.1 Phenolphthalein Indicator — Prepared by dissolving 0.1 g of phenolphthalein in 100 ml of 60 percent ethyl alcohol (IS 2263).

C-2.2 Standard Sodium Hydroxide Solution, 0.01N.

C-3 PROCEDURE

Place 100 ml of water and a few pieces of clean porous porcelain in a 500 ml resistance glass conical flask and boil gently for 5 minutes to eliminate carbon dioxide. Cool slightly and add 100 ml of the material. Boil gently for a further period of 5 min. At the end of this period, close the neck of the flask with a stopper carrying a soda-lime tube and allow to cool. When cold, remove the stopper, add 0.5 ml of phenolphthalein indicator and examine For alkalinity; if not alkaline, titrate with standard sodium hydroxide solution using a micro-burette.

C-4 CALCULATION

Acidity (as CH_3COOH), percent by mass = $\frac{6VN}{100S}$

Where,

V = volume in nil, of standard sodium hydroxide solution used;

N = normality of standard sodium hydroxide solution; and

S = specific gravity of the material at the temperature of determination.

ANNEX D

[*Table* 1, *Sl No.* (xii)]

CHLORIDE IN METHANOL

D-1 SCOPE

This method describes a procedure for the determination of inorganic chloride in methanol in the range of 0.25 mg/kg to 10 mg/kg.

WARNING — *See* material safety data sheets of methanol, glacial acetic acid and silver nitrate.

D-2 OUTLINE OF THE METHOD

A weight amount of sample is dissolved in a known volume of titration solvent containing already some chloride. The mixture is potentimetrically titrated with standard alcoholic silver nitrate. The determination is carried out in duplicate. Quality criteria for the blank determination, the difference of the duplicate analysis results and the QC sample have to be met.

D-3 APPARATUS

D-3.1 Titroprocessor, equipped with a combi *Ag/Ag Cl* electrode or equivalent instrument.

D-3.2 Volumetric Flask, 1 000 ml.

D-3.3 Pipettes of 10 ml and 100 ml.

D- 3.4 PTFE Coated Stirring Bar.

D-4 CHEMICALS

D-4.1 Titration Solvent

Mix 850 ml acetone, 150 ml glacial acetic acid and 10 ml of 1 mmol/ l hydrochloric acid.

NOTE — Ensure that sufficient titration solvent is prepared to test each series of samples and blanks.

D-4.2 Silver Nitrate Stock Solution (IS 2214)

Take standard solution 0.1 N, in water. Prepare, store and standardize.

NOTE — ASTM E200 is also be available for standardization of silver nitrate.

D-4.3 Alcoholic Silver Nitrate Solution

Standard solution 0.0001 N in isopropanol. Pipette 10.00 ml of standard 0.1 N silver nitrate (**5.2**) into a 1 000 ml volumetric flask, make up to the mark with isopropanol and homogenize.

D-4.4 Quality Control Sample with a chloride concentration of 0.3 – 1.0 mg/l.

D-5 PROCEDURE

D-5.1 Perform the analysis in duplicate.

D-5.2 Prepare the titroprocessor and electrodes as described in the manual.

D-5.3 Weigh 50 g sample to the nearest 0.1 g (100 mg) into the titration vessel. Pipette 100 ml of titration solvent (**4.1**) into the titration vessel and add a PTFE coated stirring bar.

D-5.4 Place the titration vessel on the magnetic stirrer of the titroprocessor and immerse the electrode in the sample solution. Immerse the tip of the burette below the surface of the liquid and adjust the magnetic stirrer to produce vigorous stirring without splattering. Ensure that the sample is completely dissolved.

D-5.5 Titrate the sample with 0.001 N alcoholic silver nitrate according to the manual of the titroprocessor. For each series of sample determinations carry out 2 blank determinations, following the procedure described in **5.3** but omitting the sample. The blank titration volumes should not differ by more than 0.02 ml. For each series of sample determinations, determine the chloride content of a QC sample, following the procedure described in **5.3**. The results of the QC sample must be 0.8 - 1.2 times the theoretical value.

D-6 CALCULATION

Calculate the chloride content in mg/kg for each single determination as follows:

$$\text{Chloride, mg/kg} = \frac{(V_1 - V_2) \times C \times 35.5 \times 1000}{m \times 100}$$

Where,

V_1 = volume in ml, of alcoholic silver nitrate (**5.3**) used for sample titration;

V_2 = average volumes in ml, of alcoholic silver nitrate (**5.3**) used for the two blank titrations;

C = titer, in mol/1, of the standardized aqueous silver nitrate stock solution; and

m = sample weight, in g.

The average of the two duplicate determinations is calculated as final result.

D-7 REPORT

The chloride content should be reported in mg/kg and rounded to the nearest 0.1 mg/kg. The lower limit of this determination is 0.25 mg/kg.

D-8 PRECISION

The difference between successive test results, obtained by the same operator using the same apparatus on identical test material exceeds 0.03 mg/kg only in 1 case in 20. Differences greater than this should be considered suspect. The difference between two single and independent test results, obtained by different operators working in different laboratories on identical test material, exceeds 0.3 mg/kg only 1 case in 20. Differences greater than this should be considered suspect.

ANNEX E

(*Clause* 6)

SAMPLING OF METHANOL

E-1 GENERAL REQUIREMENTS OF SAMPLING

E-1.1 In drawing, preparing, storing and handling test samples, the following precautions and directions shall be observed.

E-1.2 Samples shall be taken in a protected area with good ventilation. The samples shall be kept away from flames.

E-1.3 The sampling instrument shall be clean and dry.

E-1.4 The samples, the material being sampled, the sampling instrument and the containers for samples shall be protected from adventitious contamination.

E-1.5 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring, or both or by rolling so as to bring all portions into uniform distribution.

E-1.6 The samples shall be placed in suitable, clean, dry and air-tight glass containers.

E-1.7 The sample, containers shall be of such a size that they are almost, but not completely, filled by sample.

E-1.8 Each sample container shall be sealed air-tight with a suitable stopper after filling, and marked with the manufacture of the material, the batch number (if available), and other details of sampling, such as the date of sampling and sampler’s name.

E-1.9 Sample shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature

E-2 SAMPLING INSTRUMENTS

The following forms of sampling instruments may be used:

a) Weighted sampling can for taking samples from various depths in large tanks, and
b) Sampling tube.

E-2.1 Weighed Sampling Can

Of suitable capacity, 500 to 1 000 ml and of such a mass as to sink readily in the material to be sampled. It has a long chain or cord attached to permit filling at any desired level (*see* Fig. 1). The metal used to weigh the apparatus shall be fitted externally, as irregularities in the metal are likely to contaminate the sample, if the weight is fitted internally.

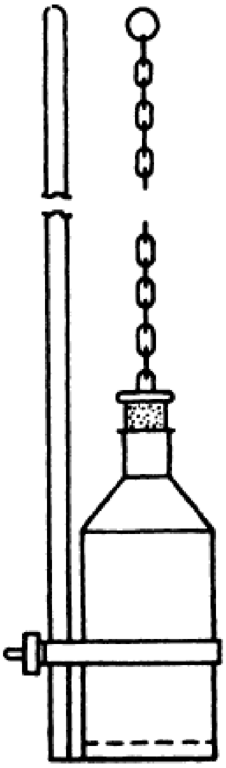


FIG. 1 WEIGHTED SAMPLING CAN

E-2.2 Sample Tube

It is made of metal or thick glass and is 20 to 40 mm in diameter and 400 to 800 mm in length (*see* Fig. 2). The upper and lower ends are conical and reach 5 to 10 mm diameter at the narrow ends. Handling is facilitated by two rings at the upper end. For taking a sample, the apparatus is first closed at the top with the thumb or a stopper and lowered until the desired depth is reached. It is then opened for a short time to admit the material and finally closed and withdrawn.

E-2.2.1 For small containers, the size of the sampling tube may be altered suitably.

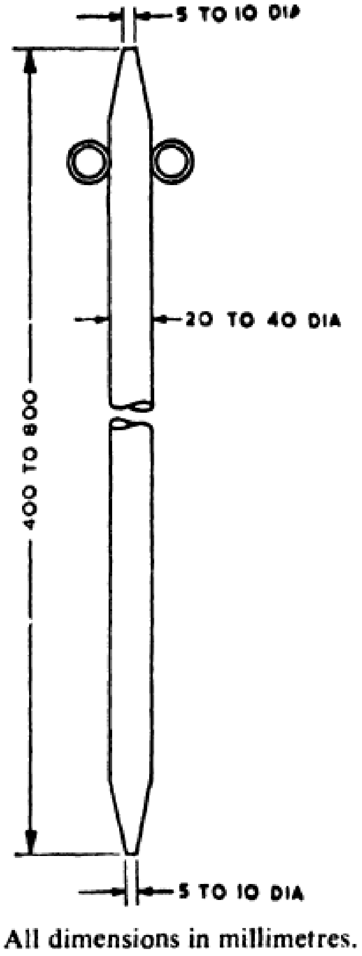


FIG. 2 SAMPLING TUBE

E-3 SCALE OF SAMPLING

E-3.1 Lot

In any consignment, all the containers of the same size and grade belonging to the same batch of manufacture shall constitute a lot. If a consignment is known to consist of different batches of manufacture or of different sizes of containers, the containers belonging to the same batch and size shall be grouped together and each such group shall constitute a separate lot.

E-3.2 For ascertaining the conformity of the material in a lot to the requirements of this specification, tests shall be carried out for each lot separately. For this purpose, the number of containers to be selected in accordance with Table 2.

E-3.2.1 The containers shall be chosen at random from the lot. To ensure the randomness of selection, procedure given in IS 4905 may be followed.

Table 2 Scale of Sampling

(*Clause* E-3.2)

No. of Containers in the Lot *N* (1)	No. of Containers to be Selected *n* (2)
Up to 25	3
26 to 100	4
101 to 150	5
151 to 300	7
301 and above	10

E-4 TEST SAMPLES AND REFEREE SAMPLES

E-4.1 Preparation of Sets of Samples for Testing Individually

Draw with an appropriate sampling instrument (*see* **E-2**), equal portions of the material from different parts of each container selected as in **E-3.2** and freshly opened. Mix these small portions of the material from the same container to obtain a sample, representative of the container. Keep these representative samples from different containers separately. From each representative sample, draw three equal portions of the material, each sufficient for carrying out the intended tests and transfer them into thoroughly cleaned and dry sample containers. Seal the sample containers air-tight. Thus three sets of test samples are obtained such that each set has a test sample from each selected container. Send one each of these sets to the purchaser and the supplier. Reserve the third set as referee sample bearing the seals of the purchaser and the supplier. Keep the referee sample at a place agreed to between the purchaser and the supplier.

E-4.2 Preparation of Composite Samples

Draw, with an appropriate sampling instrument (*see* **E-2**), equal portion of material from each container selected as in **E-3.2** and mix them together thoroughly to constitute a single composite sample. Divide this composite sample into three parts, each sufficient for carrying out the intended tests and transfer them to thoroughly cleaned and dry sample containers. Send one each of these to the purchaser and the supplier. Reserve the third composite sample as referee sample at a place agreed to between the purchaser and the supplier.

E-5 NUMBER OF TEST

E-5.1 Individual Samples

Test for distillation range, specific gravity, aldehydes and ketones (as acetone) shall be carried out individually on each of the test samples in a set prepared in **E-4.1.**

E-5.2 Composite Samples

Tests for the determination of the remaining characteristics of this specification shall be carried out on the composite sample prepared as in **E-4.2**.

E-6 CRITERIA FOR CONFORMITY

E-6.1 For Composite Samples

The lot shall be declared as conforming to the requirements of this specification if each of the test results made on the composite sample (**E-5.2**) satisfies the corresponding requirements of this specification.

E-6.2 For Individual Samples

The lot shall be declared as conforming to this specification if for each of the characteristics tested on the individual samples according to **E-5.1**, the mean and the range of test results be calculated as below:

> Mean (x) = sum of the test results divided by the number of test results so added; and
>
> Range (R) = difference between the maximum and minimum values of the test results.

The expression ($\bar{x}$ – 0.6R) and (x + 0.6 R) shall then be calculated. The lot shall be considered to conform in respect of the relevant characteristics, if (x = 0.6 R) is less than the maximum specified value and (x – 0.6 R) is greater than the minimum specified value. When the number of container selected is ten, it shall be divided into two groups of five each. Taking first five in one group and next five in other group, and for each group, range and its average shall be calculated. The mean range is:

$$R = \frac{\text{Sum of the ranges of two groups}}{2}$$

In the expression $x - 0.6\,R$, R shall be replaced by R to determine the conformity of the lot.

ANNEX F

BIBLOGRAPHY

Other Standards	*Title*
ASTM D 1078 - 11	Standard Test Method for Distillation Range of Volatile Organic Liquids
ASTM D 1209 - 05	Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
ASTM D 1298 -12 b	Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
ASTM D 1353 - 13	Standard Test Method for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
ASTM D 1363 - 06	Standard Test Method for Permanganate Time of Acetone and Methanol
ASTM D 1613 - 17	Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products
ASTM D 4052 - 16	Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
ASTM D 5386 - 16	Standard Test Method for Color of Liquids Using Tristimulus Colorimetry
ASTM D 5453 - 16e1	Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence
ASTM E 1604 - 16	Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration
IP 160-1999	Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method

ANNEX G

(*Foreword*)

COMMITTEE COMPOSITION

Petroleum and Their Related Products of Synthesis or Biological Origin Sectional Committee, PCD 03

Organization	*Representative(s)*
Indian Institute of Technology, Delhi	Prof L. M. Das (***Chairman***)
Ashok Leyland Ltd, Chennai	Shri Ravi M. Shri Arun S. (*Alternate*)
Afton Chemicals, Mumbai	Shri Harshad Jambaulikar Shri Jeenal Patel (*Alternate*)
Association of State Road Transport Undertaking (ASRTU), Pune	Shri Anand Rao
Bajaj Auto Ltd, Pune	Shri K. Rajan Shri Girish S. Kodolikar (*Alternate*)
Bharat Oman Refineries Lid, Sagar, MP	Shri Anand Pratap Raghav Shri B. Sridhar (*Alternate*)
Bharat Petroleum Corporation Ltd, Mumbai	Shri Debashis Ganguli Shri V. Suresh (*Alternate*)
Biogas Forum, New Delhi	Dr A. R. Shukla
Biodiesel Association of India, Mumbai	Shri Sandeep Chaturvedi Shri Ashish Kumar Singh (*Alternate*)
Bosch Ltd, Bengaluru	Shri A. Fredrick Shri D. Ramaraju (*Alternate*)
Centre for Consumer Education, Research, Teaching, Training and Testing (CONCERT), Chennai	Shri R. Balasubranian
Centre for High Technology, New Delhi	Shri Brijesh Kumar Shri S. N. Sukhwal (*Alternate*)
Centre for Science and Environment (CSE), New Delhi	Ms Anumita Roychowdhury Shri Vivek Chattopadhya (*Alternate*)
Chennai Petroleum Corporation Ltd (CPCL), Chennai	Shri S. Kumar Shri H. Ramakrishnan (*Alternate*)
Central Pollution Control Board, (Ministry of Environment & Forests), New Delhi	Shri Dinabandhu Gouda
Consumer Guidance Society of India, Mumbai	Dr Sitaram Dixit Dr M. S. Kamath (*Alternate*)
Directorate General of Civil Aviation, New Delhi	Shri Amit Gupta Shri Dharmendra SinghYadav (*Alternate* I) Shri Rakesh Kumar (*Alternate* II)
General Motors, Maharashtra	Shri Sunil P. S. Shri Rajendra Khile (*Alternate*)
Gulf Oil Lubricants India Ltd, Mumbai	Dr Y. P. Rao Ms Indu M. Gupta (*Alternate*)
Hero Motocorp Ltd, Gurugram	Shri Ajay Gupta Shri Ashok Kataria (*Alternate*)
Hindustan Petroleum Corporation Ltd, Mumbai	Shri A. K. Jain Shri Sunny C.M. (*Alternate*)
Honda Cars, Noida, UP	Shri Tarun Bhat Shri N. S. Talib, (*Alternate*)

Organization	*Representative(s)*
Indian Institute of Petroleum, Dehradun	Dr Anjan Ray Dr T. Bhaskar (*Alternate*)
Indian Oil Corporation Ltd, (R&D Centre), Faridabad	Shri Reji Mathai Shri V. Kagdiyal (*Alternate*)
Indian Oil Corporation Ltd, (Refineries), New Delhi	Shri J. Agarwalla Dr Y. S. Jhala (*Alternate*)
Lubrizol India Ltd, Mumbai	Shri Anand Redkar Shri Sharad Tarsode (*Alternate*)
Mahindra & Mahindra Ltd, Chennai	Shri R. Ramaprabhu
Mangalore Refinery & Petro-Chemical Ltd,	Shri V. Nanda Kumar Shri M. Salinakumar (*Alternate*)
Maruti Udyog Ltd, Gurgaon	Shri Shailender Sharma Shri Vikram Khanna (*Alternate*)
Ministry of Agriculture, Delhi	Representative
Ministry of Defence (DRDO), Ahmednagar	Shri K. Mathivanan Shri K. Senthil Kumar (*Alternate*)
Ministry of Petroleum and Natural Gas, New Delhi	Representative
Ministry of Railways (RDSO), Lucknow	Representative
Ministry of Road Transport & Highways, New Delhi	Representative
MNRE, Delhi	Shri S. K. Jagwani Dr Vasantha Thakur (*Alternate*)
Nayara Energy Limited, Mumbai	Shri Shyama S. Maji Shri Dhaval Doshi (*Alternate*)
ONGC, Surat	Dr J. K. Srivastava
Petroleum Conservation Research Association, New Delhi	Shri Surendra Pratap Shri M. P. Bangwal (*Alternate*)
Petroleum and Explosives Safety Organization, Nagpur	Dr S. K. Dixit Shri Ninad Gawade (*Alternate*)
Reliance Petroleum Limited, Mumbai	Shri Subir K. Chattopadhyay Shri Ravi V. Desai (*Alternate*)
Society of Indian Automobile Manufacturers, New Delhi	Shri P. K. Banerjee Shri Atanu Ganguli (*Alternate*)
Tata Motors Ltd, Pune	Shri T. Sethuramalingam Ms P. B. Dakhole (*Alternate* I) Shri S. B. Gudekar (*Alternate* II)
The Automotive Research Association of India (ARAI), Pune	Shri M. A. Bawase Dr S. S. Thipse (*Alternate*)
TVS Motor Company Ltd, Hosur, Tamil Nadu	Shri S. Ajith Kumar
VRDE, Ahmed Nagar	Shri K. Mathivanan Shri K. Senthil Kumar (*Alternate*)
In personal capacity, New Delhi	Dr Vijay Malik
Director General, BIS	Shri V. K. Diundi, Scientist 'F' and Head (PCD), [Representing Director General (*Ex-officio*)]

Member Secretary

Shrimati Nagamani T.
Scientist 'D', BIS

Automotive, Aviation and Industrial Fuels Subcommittee, PCD 3:1

Organization	*Representative(s)*
Gulf Oil Lubricants India Ltd, Mumbai	Dr Y. P. Rao, (***Convener***) Shri Indu M. Gupta (*Alternate*)
Ashok Leyland Ltd., Chennai	Shri Ravi M. Shri D. Balakrishnan (*Alternate*)
Bajaj Auto Ltd., Pune	Shri K. Rajan Shri R. Ramakrishna (*Alternate*)
Bharat Petroleum Corporation Ltd, Mumbai	Shri Ajit K. K. Shri C. Sanmuganathan (*Alternate*)
Central Revenue Control Laboratory, New Delhi	Dr Y. K. S. Rathore
Centre for Air Military Worthiness, (CEMLIAC), Bangalore	Dr Shirish S. Kale R. Shanmugavel (*Alternate*)
Centre For High Technology, New Delhi	Shri Brijesh Kumar Shri Sushobhan Sarkar (*Alternate*)
Centre for Science and Environment (CSE), New Delhi	Ms Anumita Roychowdhury Shri Vivek Chattopadhya (*Alternate*)
Chennai Petroleum Corporation Ltd., Chennai	Shri S. Kumar Shri H. Ramakrishnan (*Alternate*)
CIMAC India, Faridabad	Shri M. B. Bansal
CONCERT, Chennai	Shri K. Krishnakumar Shri M. Somasundaram (*Alternate*)
Controllerate of Quality Assurance Petroleum Products, Ministry of Defence, DGQA, Kanpur	Shri C. B. Pandey Shri A. K. Kanaujia (*Alternate*)
Defence Materials and Stores Research & Development Establishment, Kanpur	Shri Bal Krishna Shri Tandra Nandi (*Alternate*)
Directorate General of Civil Aviation, New Delhi	Shri Amit Gupta Shri Dharmendra Singh Yadav (*Alternate* I) Shri Rakesh Kumar (*Alternate* II)
Escorts Ltd., Faridabad	Shri G. K. Sivakumar
Nayara Energy Limited	Shri Shyama Maji Shri Dhaval Doshi (*Alternate*)
Ford Motors	Representative
Harbinsons Biotech Pvt. Ltd., Gurgaon	Shri Ajit B. Seal
Hindustan Petroleum Corpn. Ltd., Mumbai	Dr A. K. Jain Shri Sunny C. M. (*Alternate*)
Indian Additives Ltd., Chennai	Representative
Indian Institute of Petroleum, Dehra Dun	Shri A. K. Jain Shri Sunil Kumar Pathak (*Alternate*)
Indian Institute of Technology, Chennai	Prof. R. P. Sharma
Indian Institute of Technology,(CES), Delhi	Prof V. K. Vijay
Indian Oil Corporation Ltd. (Marketing Division), Mumbai	Shri P. D. Dusane
Indian Oil Corporation Ltd. (R&D Centre), Faridabad	Dr A. K. Arora Dr A. P. Singh (*Alternate*)
Indian Oil Corporation Ltd. (R&P Division), New Delhi	Shri J. Agarwalla Dr Y. S. Jhala (*Alternate*)

Organization	*Representative(s)*
Kochi - BPCL Refineries Ltd., Kochi	Shri Pradeepkumar T. Shri R. Raju (*Alternate*)
Lubrizol India Ltd., Mumbai	Shri Sharad Tarsode
Mahindra & Mahindra Ltd., Nasik	Shri R. Ramaprabhu
Mangalore Refinery & Petro-chemical Ltd., Mangalore	Shri V. Nanda Kumar Shri Salina Kumar (*Alternate*)
Maruti Udyog Ltd., Gurgaon	Shri Shailender Sharma Shri Vikram Khanna (*Alternate*)
Ministry of Petroleum & Natural Gas, New Delhi	Representative
Ministry of Railways (RDSO), Lucknow	Shri A. K. Sabharwal Dr K. Konar (*Alternate*)
Bosch Ltd., Bengaluru	Shri A. Fredrick Shri D. Ramaraju (*Alternate*)
Numaligarh Refinery Ltd., Assam	Shri Bimlesh Gupta Shri Pallab Das (*Alternate*)
ONGC, Surat	Shri K. S. Pantey Shri Dinesh Kumar (*Alternate*)
Petrofed, Delhi	Shri N. K. Bansal Dr Preeti Jain (*Alternate*)
Reliance Industries Ltd., Mumbai	Shri Subir K. Chattopadhyay Shri Ravishankar V. Desai (*Alternate*)
Society for Petroleum Laboratory (SFPL)/Fuel Testing Laboratory(FTL), Noida	Dr A. K. Gupta Shri C. Shankar (*Alternate*)
Society of Indian Automobile Manufacturers, New Delhi	Shri P. K. Banerjee Shri Atanu Ganguli (*Alternate*)
Tata Motors Ltd., Pune	Shri T. Sethuramalingam Shri S. B. Gudekar (*Alternate*)
The Automotive Research Association of India, Pune	Shri M. A. Bawase Dr S. S. Thipse (*Alternate*)
Hero Moto Corp., Gurgaon	Shri T. M. Balaraman Shri Mohit Gupta (*Alternate*)
BORL, Sagar	Shri B. Sridhar Shri Bharat Kumar Sharma (*Alternate*)
Afton Chemicals, Mumbai	Shri Harshad Jambaulikar Shri Jeenal Patel (*Alternate*)
Honda Cars, Noida	Shri Tarun Bhat Shri N. S. Talib (*Alternate*)
Emami agrotech Ltd, Haldia	Shri S. K. Mondal
MNRE, Delhi	Shri S. K. Jagwani Dr Vasantha Thakur(*Alternate*)
ISMA, Delhi	Shri G. K. Thakur
Kaleesuwari Refinery and Industry Pvt Ltd (KRIPL)	Shri Shyam Sundar Sai Nudurupati

Panel for Methanol Fuels, PCD 3:1/P-1

Organization	*Representative(s)*
In personal capacity	Dr Mathew Abraham (***Convener***)
Afton Chemical, Mumbai	Shri Anand Kumar
Ashok Leyland, Chennai	Shri G. Senthil Kumar
Bharat Petroleum Corporation, Delhi	Shri C. Shanmuganathan
Bureau of Indian Standards	Smt Nagamani T.
Hero Motor Corporation, Delhi	Shri Harjeet Singh Shri P. Sanup (*Alternate*)
Indian Institute of Petroleum, Dehradun	Dr A. K. Jain Shri Iranna Gogeri (*Alternate* I) Shri M. N. Shykla (*Alternate* II)
Indian Oil Corporation, (R&D), Faridabad	Dr Reji Mathai Dr Vivekhanand Kagdiyal (*Alternate* I) Dr A. S. Ramadhas (*Alternate* II)
Indian Oil Corporation (Mktg)	Shri P. D. Dusane
Indian Institute of Technology, Delhi	Prof K. K. Pant
Individual Capacity	Shri Prashanth Guru Srinivas
Mahindra & Mahindra Ltd., Chennai	Shri R. Ramaprabhu
Maruti Suzuki India Ltd., Delhi	Shri Anoop Bhat Shri Ajay Kumar (*Alternate*)
Rashtriya Chemicals and Fertilizers Ltd.	Shri Vasant Nandekar
The Automotive Research Association of India (ARAI), Pune	Dr S. S. Thipse
Thermax Global	Dr Dev Kumar Gupta
SIAM, New Delhi	Shri Diwit Prajapati

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: PCD 03 (12872).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	265 0206 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	2832 9295, 2832 7858 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi